<110> Boehringer Ingelheim Vetmedica GmbH

<120> Recombinant attenuation of Porcine Reproductive and Respiratory Syndrome (PRRSV)

<130> 1-1120,25,26-1-C1

<140> to be assigned
<141> June 20, 2003

<150> 09/772,316
<151> January 26, 2001

<150> DE 10003371.7
<151> 2000-01-26

<150> DE 10003373.3
<151> 2000-01-26

<150> DE 10003372.5
<151> 2000-01-26

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<170> PatentIn Ver. 2.1

<210> 1
<211> 2502
<212> PRT
<213> Porcine reproductive and respiratory syndrome virus

<400> 1

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Met Ser Gly Ile Leu Asp Arg Cys Thr Cys Thr Pro Asn Ala Arg Val
  1               5                  10                  15

Phe Met Ala Glu Gly Gln Val Tyr Cys Thr Arg Cys Leu Ser Ala Arg
             20                  25                  30

Ser Leu Leu Pro Leu Asn Leu Gln Val Ser Glu Leu Gly Val Leu Gly
          35                  40                  45

Leu Phe Tyr Arg Pro Glu Glu Pro Leu Arg Trp Thr Leu Pro Arg Ala
     50                  55                  60

Phe Pro Thr Val Glu Cys Ser Pro Ala Gly Ala Cys Trp Leu Ser Ala
 65                  70                  75                  80

Ile Phe Pro Ile Ala Arg Met Thr Ser Gly Asn Leu Asn Phe Gln Gln
                 85                  90                  95

Arg Met Val Arg Val Ala Ala Glu Leu Tyr Arg Ala Gly Gln Leu Thr
                100                 105                 110

Pro Ala Val Leu Lys Ala Leu Gln Val Tyr Glu Arg Gly Cys Arg Trp
            115                 120                 125
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Tyr Pro Ile Val Gly Pro Val Pro Gly Val Ala Val Phe Ala Asn Ser
    130             135             140

Leu His Val Ser Asp Lys Pro Phe Pro Gly Ala Thr His Val Leu Thr
145             150             155             160

Asn Leu Pro Leu Pro Gln Arg Pro Lys Pro Glu Asp Phe Cys Pro Phe
            165             170             175

Glu Cys Ala Met Ala Thr Val Tyr Asp Ile Gly His Asp Ala Val Met
            180             185             190

Tyr Val Ala Glu Arg Lys Val Ser Trp Ala Pro Arg Gly Gly Asp Glu
        195             200             205

Val Lys Phe Glu Ala Val Pro Gly Glu Leu Lys Leu Ile Ala Asn Arg
    210             215             220

Leu Arg Thr Ser Phe Pro Pro His His Thr Val Asp Met Ser Lys Phe
225             230             235             240

Ala Phe Thr Ala Pro Gly Cys Gly Val Ser Met Arg Val Glu Arg Gln
            245             250             255

His Gly Cys Leu Pro Ala Asp Thr Val Pro Glu Gly Asn Cys Trp Trp
            260             265             270

Ser Leu Phe Asp Leu Leu Pro Leu Glu Val Gln Asn Lys Glu Ile Arg
        275             280             285

His Ala Asn Gln Phe Gly Tyr Gln Thr Lys His Gly Val Ser Gly Lys
    290             295             300

Tyr Leu Gln Arg Arg Leu Gln Val Asn Gly Leu Arg Ala Val Thr Asp
305             310             315             320

Leu Asn Gly Pro Ile Val Val Gln Tyr Phe Ser Val Lys Glu Ser Trp
            325             330             335

Ile Arg His Leu Lys Leu Ala Gly Glu Pro Ser Tyr Ser Gly Phe Glu
            340             345             350

Asp Leu Leu Arg Ile Arg Val Glu Pro Asn Thr Ser Pro Leu Ala Asp
        355             360             365

Lys Glu Glu Lys Ile Phe Arg Phe Gly Ser His Lys Trp Tyr Gly Ala
    370             375             380

Gly Lys Arg Ala Arg Lys Ala Arg Ser Cys Ala Thr Ala Thr Val Ala
385             390             395             400

Gly Arg Ala Leu Ser Val Arg Glu Thr Arg Gln Ala Lys Glu His Glu
            405             410             415

Val Ala Gly Ala Asn Lys Ala Glu His Leu Lys His Tyr Ser Pro Pro
            420             425             430
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Ala Glu Gly Asn Cys Gly Trp His Cys Ile Ser Ala Ile Ala Asn Arg
        435             440             445

Met Val Asn Ser Lys Phe Glu Thr Thr Leu Pro Glu Arg Val Arg Pro
        450             455             460

Pro Asp Asp Trp Ala Thr Asp Glu Asp Leu Val Asn Ala Ile Gln Ile
465             470             475             480

Leu Arg Leu Pro Ala Ala Leu Asp Arg Asn Gly Ala Cys Thr Ser Ala
            485             490             495

Lys Tyr Val Leu Lys Leu Glu Gly Glu His Trp Thr Val Thr Val Thr
            500             505             510

Pro Gly Met Ser Pro Ser Leu Leu Pro Leu Glu Cys Val Gln Gly Cys
        515             520             525

Cys Gly His Lys Gly Gly Leu Gly Ser Pro Asp Ala Val Glu Val Ser
    530             535             540

Gly Phe Asp Pro Ala Cys Leu Asp Arg Leu Ala Glu Val Met His Leu
545             550             555             560

Pro Ser Ser Ala Ile Pro Ala Ala Leu Ala Glu Met Ser Gly Asp Ser
            565             570             575

Asp Arg Ser Ala Ser Pro Val Thr Thr Val Trp Thr Val Ser Gln Phe
            580             585             590

Phe Ala Arg His Ser Gly Gly Asn His Pro Asp Gln Val Arg Leu Gly
            595             600             605

Lys Ile Ile Ser Leu Cys Gln Val Ile Glu Asp Cys Cys Cys Ser Gln
    610             615             620

Asn Lys Thr Asn Arg Val Thr Pro Glu Glu Val Ala Ala Lys Ile Asp
625             630             635             640

Leu Tyr Leu Arg Gly Ala Thr Asn Leu Glu Glu Cys Leu Ala Arg Leu
            645             650             655

Glu Lys Ala Arg Pro Pro Arg Val Ile Asp Thr Ser Phe Asp Trp Asp
            660             665             670

Val Val Leu Pro Gly Val Glu Ala Ala Thr Gln Thr Ile Lys Leu Pro
            675             680             685

Gln Val Asn Gln Cys Arg Ala Leu Val Pro Val Val Thr Gln Lys Ser
    690             695             700

Leu Asp Asn Asn Ser Val Pro Leu Thr Ala Phe Ser Leu Ala Asn Tyr
705             710             715             720

Tyr Tyr Arg Ala Gln Gly Asp Glu Val Arg His Arg Glu Arg Leu Thr
            725             730             735
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Ala Val Leu Ser Lys Leu Glu Lys Val Val Arg Glu Glu Tyr Gly Leu
        740             745                 750

Met Pro Thr Glu Pro Gly Pro Arg Pro Thr Leu Pro Arg Gly Leu Asp
        755             760                 765

Glu Leu Lys Asp Gln Met Glu Glu Asp Leu Leu Lys Leu Ala Asn Ala
    770             775                 780

Gln Thr Thr Ser Asp Met Met Ala Trp Ala Val Glu Gln Val Asp Leu
785             790                 795                 800

Lys Thr Trp Val Lys Asn Tyr Pro Arg Trp Thr Pro Pro Pro Pro Pro
            805             810                 815

Pro Lys Val Gln Pro Arg Lys Thr Lys Pro Val Lys Ser Leu Pro Glu
        820             825                 830

Arg Lys Pro Val Pro Ala Pro Arg Arg Lys Val Gly Ser Asp Cys Gly
        835             840                 845

Ser Pro Val Ser Leu Gly Gly Asp Val Pro Asn Ser Trp Glu Asp Leu
    850             855                 860

Ala Val Ser Ser Pro Phe Asp Leu Pro Thr Pro Pro Glu Pro Ala Thr
865             870                 875                 880

Pro Ser Ser Glu Leu Val Ile Val Ser Ser Pro Gln Cys Ile Phe Arg
            885             890                 895

Pro Ala Thr Pro Leu Ser Glu Pro Ala Pro Ile Pro Ala Pro Arg Gly
            900             905                 910

Thr Val Ser Arg Pro Val Thr Pro Leu Ser Glu Pro Ile Pro Val Pro
            915             920                 925

Ala Pro Arg Arg Lys Phe Gln Gln Val Lys Arg Leu Ser Ser Ala Ala
        930             935                 940

Ala Ile Pro Pro Tyr Gln Asp Glu Pro Leu Asp Leu Ser Ala Ser Ser
945             950                 955                 960

Gln Thr Glu Tyr Glu Ala Ser Pro Pro Ala Pro Pro Gln Ser Gly Gly
            965             970                 975

Val Leu Gly Val Glu Gly His Glu Ala Glu Glu Thr Leu Ser Glu Ile
            980             985                 990

Ser Asp Met Ser Gly Asn Ile Lys Pro Ala Ser Val Ser Ser Ser Ser
    995                 1000                1005

Ser Leu Ser Ser Val Arg Ile Thr Arg Pro Lys Tyr Ser Ala Gln Ala
    1010                1015                1020

Ile Ile Asp Ser Gly Gly Pro Cys Ser Gly His Leu Gln Glu Val Lys
1025                1030                1035                1040

Glu Thr Cys Leu Ser Val Met Arg Glu Ala Cys Asp Ala Thr Lys Leu
            1045                1050                1055

Asp Asp Pro Ala Thr Gln Glu Trp Leu Ser Arg Met Trp Asp Arg Val
            1060                1065                1070

Asp Met Leu Thr Trp Arg Asn Thr Ser Val Tyr Gln Ala Ile Cys Thr
        1075                1080                1085

Leu Asp Gly Arg Leu Lys Phe Leu Pro Lys Met Ile Leu Glu Thr Pro
    1090                1095                1100

Pro Pro Tyr Pro Cys Glu Phe Val Met Met Pro His Thr Pro Ala Pro
1105                1110                1115                1120

Ser Val Gly Ala Glu Ser Asp Leu Thr Ile Gly Ser Val Ala Thr Glu
            1125                1130                1135

Asp Val Pro Arg Ile Leu Glu Lys Ile Glu Asn Val Gly Glu Met Ala
        1140                1145                1150

Asn Gln Gly Pro Leu Ala Phe Ser Glu Asp Lys Pro Val Asp Asp Gln
        1155                1160                1165

Leu Val Asn Asp Pro Arg Ile Ser Ser Arg Arg Pro Asp Glu Ser Thr
    1170                1175                1180

Ser Ala Pro Ser Ala Gly Thr Gly Gly Ala Gly Ser Phe Thr Asp Leu
1185                1190                1195                1200

Pro Pro Ser Asp Gly Ala Asp Ala Asp Gly Gly Gly Pro Phe Arg Thr
        1205                1210                1215

Val Lys Arg Lys Ala Glu Arg Leu Phe Asp Gln Leu Ser Arg Gln Val
        1220                1225                1230

Phe Asp Leu Val Ser His Leu Pro Val Phe Phe Ser Arg Leu Phe Tyr
        1235                1240                1245

Pro Gly Gly Gly Tyr Ser Pro Gly Asp Trp Gly Phe Ala Ala Phe Thr
    1250                1255                1260

Leu Leu Cys Leu Phe Leu Cys Tyr Ser Tyr Pro Ala Phe Gly Ile Ala
1265                1270                1275                1280

Pro Leu Leu Gly Val Phe Ser Gly Ser Ser Arg Arg Val Arg Met Gly
        1285                1290                1295

Val Phe Gly Cys Trp Leu Ala Phe Ala Val Gly Leu Phe Lys Pro Val
        1300                1305                1310

Ser Asp Pro Val Gly Ala Ala Cys Glu Phe Asp Ser Pro Glu Cys Arg
        1315                1320                1325

Asn Ile Leu His Ser Phe Glu Leu Leu Lys Pro Trp Asp Pro Val Arg
    1330                1335                1340

Ser Leu Val Val Gly Pro Val Gly Leu Gly Leu Ala Ile Leu Gly Arg
1345                1350                1355                1360

Leu Leu Gly Gly Ala Arg Cys Ile Trp His Phe Leu Leu Arg Leu Gly
              1365                1370                1375

Ile Val Ala Asp Cys Ile Leu Ala Gly Ala Tyr Val Leu Ser Gln Gly
          1380                1385                1390

Arg Cys Lys Lys Cys Trp Gly Ser Cys Ile Arg Thr Ala Pro Asn Glu
      1395                1400                1405

Val Ala Phe Asn Val Phe Pro Phe Thr Arg Ala Thr Arg Ser Ser Leu
    1410                1415                1420

Ile Asp Leu Cys Asp Arg Phe Cys Ala Pro Lys Gly Met Asp Pro Ile
1425                1430                1435                1440

Phe Leu Ala Thr Gly Trp Arg Gly Cys Trp Ala Gly Arg Ser Pro Ile
              1445                1450                1455

Glu Gln Pro Ser Glu Lys Pro Ile Ala Phe Ala Gln Leu Asp Glu Lys
          1460                1465                1470

Lys Ile Thr Ala Arg Thr Val Val Ala Gln Pro Tyr Asp Pro Asn Gln
      1475                1480                1485

Ala Val Lys Cys Leu Arg Val Leu Gln Ser Gly Gly Arg Trp Trp Leu
    1490                1495                1500

Ser Gly Pro Lys Ser Gly Gln Gly Phe Arg Cys Ser Ile Pro Ser Pro
1505                1510                1515                1520

Phe Phe Pro Thr Gly Val Lys Val Asp Pro Asp Cys Arg Val Val Val
              1525                1530                1535

Asp Pro Asp Thr Phe Thr Ala Ala Leu Arg Ser Gly Tyr Ser Thr Thr
          1540                1545                1550

Asn Leu Val Leu Gly Val Gly Asp Phe Ala Gln Leu Asn Gly Leu Lys
      1555                1560                1565

Ile Arg Gln Ile Ser Lys Pro Ser Gly Gly Gly Pro His Leu Met Ala
    1570                1575                1580

Ala Leu His Val Ala Cys Ser Met Ala Leu His Met Leu Ala Gly Ile
1585                1590                1595                1600

Tyr Val Thr Ala Val Gly Ser Cys Gly Thr Gly Thr Asn Asp Pro Trp
              1605                1610                1615

Cys Ala Asn Pro Phe Ala Val Pro Gly Tyr Gly Pro Gly Ser Leu Cys
          1620                1625                1630

Thr Ser Arg Leu Cys Ile Ser Gln His Gly Leu Thr Leu Pro Leu Thr
      1635                1640                1645

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Ala Leu Val Ala Gly Phe Gly Ile Gln Glu Ile Ala Leu Val Val Leu
    1650                1655                1660

Ile Phe Val Ser Ile Gly Gly Met Ala His Arg Leu Ser Cys Lys Ala
1665                1670                1675                1680

Asp Met Leu Cys Val Leu Leu Ala Ile Ala Ser Tyr Val Trp Val Pro
            1685                1690                1695

Leu Thr Trp Leu Leu Cys Val Phe Pro Cys Trp Leu Arg Cys Phe Ser
            1700                1705                1710

Leu His Pro Leu Thr Ile Leu Trp Leu Val Phe Phe Leu Ile Ser Val
        1715                1720                1725

Asn Met Pro Ser Gly Ile Leu Ala Met Val Leu Leu Val Ser Leu Trp
    1730                1735                1740

Leu Leu Gly Arg Tyr Thr Asn Val Ala Gly Leu Val Thr Pro Tyr Asp
1745                1750                1755                1760

Ile His His Tyr Thr Ser Gly Pro Arg Gly Val Ala Ala Leu Ala Thr
            1765                1770                1775

Ala Pro Asp Gly Thr Tyr Leu Ala Ala Val Arg Arg Ala Ala Leu Thr
            1780                1785                1790

Gly Arg Thr Met Leu Phe Thr Pro Ser Gln Leu Gly Ser Leu Leu Glu
        1795                1800                1805

Gly Ala Phe Arg Thr Arg Lys Pro Ser Leu Asn Thr Val Asn Val Ile
    1810                1815                1820

Gly Ser Ser Met Gly Ser Gly Gly Val Phe Thr Ile Asp Gly Lys Val
1825                1830                1835                1840

Lys Cys Val Thr Ala Ala His Val Leu Thr Gly Asn Ser Ala Arg Val
            1845                1850                1855

Ser Gly Val Gly Phe Asn Gln Met Leu Asp Phe Asp Val Lys Gly Asp
        1860                1865                1870

Phe Ala Ile Ala Asp Cys Pro Asn Trp Gln Gly Ala Ala Pro Lys Thr
        1875                1880                1885

Gln Phe Cys Thr Asp Gly Trp Thr Gly Arg Ala Tyr Trp Leu Thr Ser
    1890                1895                1900

Ser Gly Val Glu Pro Gly Val Ile Gly Lys Gly Phe Ala Phe Cys Phe
1905                1910                1915                1920

Thr Ala Cys Gly Asp Ser Gly Ser Pro Val Ile Thr Glu Ala Gly Glu
            1925                1930                1935

Leu Val Gly Val His Thr Gly Ser Asn Lys Gln Gly Gly Gly Ile Val
        1940                1945                1950
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Thr Arg Pro Ser Gly Gln Phe Cys Asn Val Ala Pro Ile Lys Leu Ser
     1955                1960                1965

Glu Leu Ser Glu Phe Phe Ala Gly Pro Lys Val Pro Leu Gly Asp Val
   1970                1975                1980

Lys Val Gly Ser His Ile Ile Lys Asp Ile Ser Glu Val Pro Ser Asp
1985                1990                1995                2000

Leu Cys Ala Leu Leu Ala Ala Lys Pro Glu Leu Glu Gly Gly Leu Ser
            2005                2010                2015

Thr Val Gln Leu Leu Cys Val Phe Phe Leu Leu Trp Arg Met Met Gly
            2020                2025                2030

His Ala Trp Thr Pro Leu Val Ala Val Ser Phe Phe Ile Leu Asn Glu
        2035                2040                2045

Val Leu Pro Ala Val Leu Val Arg Ser Val Phe Ser Phe Gly Met Phe
     2050                2055                2060

Val Leu Ser Trp Leu Thr Pro Trp Ser Ala Gln Val Leu Met Ile Arg
2065                2070                2075                2080

Leu Leu Thr Ala Ala Leu Asn Arg Asn Arg Trp Ser Leu Ala Phe Phe
            2085                2090                2095

Ser Leu Gly Ala Val Thr Gly Phe Val Ala Asp Leu Ala Ala Thr Gln
        2100                2105                2110

Gly His Pro Leu Gln Ala Val Met Asn Leu Ser Thr Tyr Ala Phe Leu
        2115                2120                2125

Pro Arg Met Met Val Val Thr Ser Pro Val Pro Val Ile Thr Cys Gly
     2130                2135                2140

Val Val His Leu Leu Ala Ile Ile Leu Tyr Leu Phe Lys Tyr Arg Gly
2145                2150                2155                2160

Pro His His Ile Leu Val Gly Asp Gly Val Phe Ser Ala Ala Phe Phe
            2165                2170                2175

Leu Arg Tyr Phe Ala Glu Gly Lys Leu Arg Glu Gly Val Ser Gln Ser
        2180                2185                2190

Cys Gly Met Asn His Glu Ser Leu Thr Gly Ala Leu Ala Met Arg Leu
        2195                2200                2205

Asn Asp Glu Asp Leu Asp Phe Leu Met Lys Trp Thr Asp Phe Lys Cys
     2210                2215                2220

Phe Val Ser Ala Ser Asn Met Arg Asn Ala Ala Gly Gln Phe Ile Glu
2225                2230                2235                2240

Ala Ala Tyr Ala Lys Ala Leu Arg Val Glu Leu Ala Gln Leu Val Gln
            2245                2250                2255
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Val Asp Lys Val Arg Gly Thr Leu Ala Lys Leu Glu Ala Phe Ala Asp
            2260                2265                2270

Thr Val Ala Pro Gln Leu Ser Pro Gly Asp Ile Val Val Ala Leu Gly
            2275                2280                2285

His Thr Pro Val Gly Ser Ile Phe Asp Leu Lys Val Gly Ser Thr Lys
         2290                2295                2300

His Thr Leu Gln Ala Ile Glu Thr Arg Val Leu Ala Gly Ser Lys Met
2305                2310                2315                2320

Thr Val Ala Arg Val Val Asp Pro Thr Pro Thr Pro Pro Pro Ala Pro
            2325                2330                2335

Val Pro Ile Pro Leu Pro Pro Lys Val Leu Glu Asn Gly Pro Asn Ala
            2340                2345                2350

Trp Gly Asp Glu Asp Arg Leu Asn Lys Lys Lys Arg Arg Arg Met Glu
            2355                2360                2365

Ala Leu Gly Ile Tyr Val Met Gly Gly Lys Lys Tyr Gln Lys Phe Trp
         2370                2375                2380

Asp Lys Asn Ser Gly Asp Val Phe Tyr Glu Glu Val His Asn Asn Thr
2385                2390                2395                2400

Asp Glu Trp Glu Cys Leu Arg Val Gly Asp Pro Ala Asp Phe Asp Pro
            2405                2410                2415

Glu Lys Gly Thr Leu Cys Gly His Val Thr Ile Glu Asn Lys Ala Tyr
            2420                2425                2430

His Val Tyr Thr Ser Pro Ser Gly Lys Lys Phe Leu Val Pro Val Asn
         2435                2440                2445

Pro Glu Asn Gly Arg Val Gln Trp Glu Ala Ala Lys Leu Ser Val Glu
      2450                2455                2460

Gln Ala Leu Gly Met Met Asn Val Asp Gly Glu Leu Thr Ala Lys Glu
2465                2470                2475                2480

Leu Glu Lys Leu Lys Arg Ile Ile Asp Lys Leu Gln Gly Leu Thr Lys
               2485                2490                2495

Glu Gln Cys Leu Asn Cys
            2500


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<211> 1457
<212> PRT
<213> Porcine reproductive and respiratory syndrome virus

<400> 2
Leu Ala Ala Ser Asp Leu Thr Arg Cys Gly Arg Gly Gly Leu Val Val

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Thr Glu Thr Ala Val Lys Ile Val Lys Phe His Asn Arg Thr Phe Thr
             20                    25                    30

Leu Gly Pro Val Asn Leu Lys Val Ala Ser Glu Val Glu Leu Lys Asp
             35                    40                    45

Ala Val Glu His Asn Gln His Pro Val Ala Arg Pro Ile Asp Gly Gly
     50                    55                    60

Val Val Leu Leu Arg Ser Ala Val Pro Ser Leu Ile Asp Val Leu Ile
 65                    70                    75                    80

Ser Gly Ala Asp Ala Ser Pro Lys Leu Leu Ala His His Gly Pro Gly
                 85                    90                    95

Asn Thr Gly Ile Asp Gly Thr Leu Trp Asp Phe Glu Ser Glu Ala Thr
                100                   105                   110

Lys Glu Glu Val Ala Leu Ser Ala Gln Ile Ile Gln Ala Cys Asp Ile
        115                   120                   125

Arg Arg Gly Asp Ala Pro Glu Ile Gly Leu Pro Tyr Lys Leu Tyr Pro
        130                   135                   140

Val Arg Gly Asn Pro Glu Arg Val Lys Gly Val Leu Gln Asn Thr Arg
145                   150                   155                   160

Phe Gly Asp Ile Pro Tyr Lys Thr Pro Ser Asp Thr Gly Ser Pro Val
                165                   170                   175

His Ala Ala Ala Cys Leu Thr Pro Asn Ala Thr Pro Val Thr Asp Gly
                180                   185                   190

Arg Ser Val Leu Ala Thr Thr Met Pro Pro Gly Phe Glu Leu Tyr Val
        195                   200                   205

Pro Thr Ile Pro Ala Ser Val Leu Asp Tyr Leu Asp Ser Arg Pro Asp
        210                   215                   220

Cys Pro Lys Gln Leu Thr Glu His Gly Cys Glu Asp Ala Ala Leu Lys
225                   230                   235                   240

Asp Leu Ser Lys Tyr Asp Leu Ser Thr Gln Gly Phe Val Leu Pro Gly
                245                   250                   255

Val Leu Arg Leu Val Arg Lys Tyr Leu Phe Ala His Val Gly Lys Cys
                260                   265                   270

Pro Pro Val His Arg Pro Ser Thr Tyr Pro Ala Lys Asn Ser Met Ala
        275                   280                   285

Gly Ile Asn Gly Asn Arg Phe Pro Thr Lys Asp Ile Gln Ser Val Pro
        290                   295                   300

Glu Ile Asp Val Leu Cys Ala Gln Ala Val Arg Glu Asn Trp Gln Thr
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Val Thr Pro Cys Thr Leu Lys Lys Gln Tyr Cys Gly Lys Lys Lys Thr
            325             330                 335

Arg Thr Ile Leu Gly Thr Asn Asn Phe Ile Ala Leu Ala His Arg Ala
            340             345                 350

Val Leu Ser Gly Val Thr Gln Gly Phe Met Lys Lys Ala Phe Asn Ser
            355             360                 365

Pro Ile Ala Leu Gly Lys Asn Lys Phe Lys Glu Leu Gln Thr Pro Val
    370             375                 380

Leu Gly Arg Cys Leu Glu Ala Asp Leu Ala Ser Cys Asp Arg Ser Thr
385             390                 395                     400

Pro Ala Ile Val Arg Trp Phe Ala Ala Asn Leu Leu Tyr Glu Leu Ala
            405             410                 415

Cys Ala Glu Glu His Leu Pro Ser Tyr Val Leu Asn Cys Cys His Asp
            420             425                 430

Leu Leu Val Thr Gln Ser Gly Ala Val Thr Lys Arg Gly Gly Leu Ser
            435             440                 445

Ser Gly Asp Pro Ile Thr Ser Val Ser Asn Thr Ile Tyr Ser Leu Val
    450             455                 460

Ile Tyr Ala Gln His Met Val Leu Ser Tyr Phe Lys Ser Gly His Pro
465             470                 475                     480

His Gly Leu Leu Phe Leu Gln Asp Gln Leu Lys Phe Glu Asp Met Leu
            485             490                 495

Lys Val Gln Pro Leu Ile Val Tyr Ser Asp Asp Leu Val Leu Tyr Ala
            500             505                 510

Glu Ser Pro Thr Met Pro Asn Tyr His Trp Trp Val Glu His Leu Asn
            515             520                 525

Leu Met Leu Gly Phe Gln Thr Asp Pro Lys Lys Thr Ala Ile Thr Asp
    530             535                 540

Ser Pro Ser Phe Leu Gly Cys Arg Ile Ile Asn Gly Arg Gln Leu Val
545             550                 555                     560

Pro Asn Arg Asp Arg Ile Leu Ala Ala Leu Ala Tyr His Met Lys Ala
            565             570                 575

Ser Asn Val Ser Glu Tyr Tyr Ala Ser Ala Ala Ile Leu Met Asp
            580             585                 590

Ser Cys Ala Cys Leu Glu Tyr Asp Pro Glu Trp Phe Glu Glu Leu Val
            595             600                 605

Val Gly Ile Ala Gln Cys Ala Arg Lys Asp Gly Tyr Ser Phe Pro Gly

Thr Pro Phe Phe Met Ser Met Trp Glu Lys Leu Arg Ser Asn Tyr Glu
625                 630                 635                 640

Gly Lys Lys Ser Arg Val Cys Gly Tyr Cys Gly Ala Pro Ala Pro Tyr
                645                 650                 655

Ala Thr Ala Cys Gly Leu Asp Val Cys Ile Tyr His Thr His Phe His
            660                 665                 670

Gln His Cys Pro Val Thr Ile Trp Cys Gly His Pro Ala Gly Ser Gly
        675                 680                 685

Ser Cys Ser Glu Cys Lys Ser Pro Val Gly Lys Gly Thr Ser Pro Leu
    690                 695                 700

Asp Glu Val Leu Glu Gln Val Pro Tyr Lys Pro Pro Arg Thr Val Ile
705                 710                 715                 720

Met His Val Glu Gln Gly Leu Thr Pro Leu Asp Pro Gly Arg Tyr Gln
            725                 730                 735

Thr Arg Arg Gly Leu Val Ser Val Arg Arg Gly Ile Arg Gly Asn Glu
        740                 745                 750

Val Gly Leu Pro Asp Gly Asp Tyr Ala Ser Thr Ala Leu Leu Pro Thr
    755                 760                 765

Cys Lys Glu Ile Asn Met Val Ala Val Ala Ser Asn Val Leu Arg Ser
    770                 775                 780

Arg Phe Ile Ile Gly Pro Pro Gly Ala Gly Lys Thr Tyr Trp Leu Leu
785                 790                 795                 800

Gln Gln Val Gln Asp Gly Asp Val Ile Tyr Thr Pro Thr His Gln Thr
            805                 810                 815

Met Leu Asp Met Ile Arg Ala Leu Gly Thr Cys Arg Phe Asn Val Pro
        820                 825                 830

Ala Gly Thr Thr Leu Gln Phe Pro Val Pro Ser Arg Thr Gly Pro Trp
        835                 840                 845

Val Arg Ile Leu Ala Gly Gly Trp Cys Pro Gly Lys Asn Ser Phe Leu
    850                 855                 860

Asp Glu Ala Ala Tyr Cys Asn His Leu Asp Val Leu Arg Leu Leu Ser
865                 870                 875                 880

Lys Thr Thr Leu Thr Cys Leu Gly Asp Phe Lys Gln Leu His Pro Val
            885                 890                 895

Gly Phe Asp Ser His Cys Tyr Val Phe Asp Ile Met Pro Gln Thr Gln
            900                 905                 910

Leu Lys Thr Ile Trp Arg Phe Gly Gln Asn Ile Cys Asp Ala Ile Gln

Pro Asp Tyr Arg Asp Lys Leu Met Ser Met Val Asn Thr Thr Arg Val
    930                 935                 940

Thr Tyr Val Glu Lys Pro Val Arg Tyr Gly Gln Val Leu Thr Pro Tyr
945                 950                 955                 960

His Arg Asp Arg Glu Asp Asp Ala Ile Thr Ile Asp Ser Ser Gln Gly
                965                 970                 975

Ala Thr Phe Asp Val Val Thr Leu His Leu Pro Thr Lys Asp Ser Leu
            980                 985                 990

Asn Arg Gln Arg Ala Leu Val Ala Ile Thr Arg Ala Arg His Ala Ile
        995                 1000                1005

Phe Val Tyr Asp Pro His Arg Gln Leu Gln Gly Leu Phe Asp Leu Pro
    1010                1015                1020

Ala Lys Gly Thr Pro Val Asn Leu Ala Val His Cys Asp Gly Gln Leu
1025                1030                1035                1040

Ile Val Leu Asp Arg Asn Asn Lys Glu Cys Thr Val Ala Gln Ala Leu
            1045                1050                1055

Gly Asn Gly Asp Lys Phe Arg Ala Thr Asp Lys Arg Val Val Asp Ser
        1060                1065                1070

Leu Arg Ala Ile Cys Ala Asp Leu Glu Gly Ser Ser Ser Pro Leu Pro
        1075                1080                1085

Lys Val Ala His Asn Leu Gly Phe Tyr Phe Ser Pro Asp Leu Thr Gln
    1090                1095                1100

Phe Ala Lys Leu Pro Val Glu Leu Ala Pro His Trp Pro Val Val Ser
1105                1110                1115                1120

Thr Gln Asn Asn Glu Lys Trp Pro Asp Arg Leu Val Ala Ser Leu Arg
            1125                1130                1135

Pro Ile His Lys Tyr Ser Arg Ala Cys Ile Gly Ala Gly Tyr Met Val
        1140                1145                1150

Gly Pro Ser Val Phe Leu Gly Thr Pro Gly Val Val Ser Tyr Tyr Leu
        1155                1160                1165

Thr Lys Phe Val Lys Gly Gly Ala Gln Val Leu Pro Glu Thr Val Phe
    1170                1175                1180

Ser Thr Gly Arg Ile Glu Val Asp Cys Arg Glu Tyr Leu Asp Asp Arg
1185                1190                1195                1200

Glu Arg Glu Val Ala Ala Ser Leu Pro His Gly Phe Ile Gly Asp Val
            1205                1210                1215

Lys Gly Thr Thr Val Gly Gly Cys His His Val Thr Ser Arg Tyr Leu

Pro Arg Val Leu Pro Lys Glu Ser Val Ala Val Val Gly Val Ser Ser
        1235                    1240                    1245

Pro Gly Lys Ala Ala Lys Ala Leu Cys Thr Leu Thr Asp Val Tyr Leu
    1250                    1255                    1260

Pro Asp Leu Glu Ala Tyr Leu His Pro Glu Thr Gln Ser Lys Cys Trp
1265                    1270                    1275                    1280

Lys Met Met Leu Asp Phe Lys Glu Val Arg Leu Met Val Trp Lys Asp
                1285                    1290                    1295

Lys Thr Ala Tyr Phe Gln Leu Glu Gly Arg Tyr Phe Thr Trp Tyr Gln
                1300                    1305                    1310

Leu Ala Ser Tyr Ala Ser Tyr Ile Arg Val Pro Val Asn Ser Thr Val
        1315                    1320                    1325

Tyr Leu Asp Pro Cys Met Gly Pro Ala Leu Cys Asn Arg Arg Val Val
    1330                    1335                    1340

Gly Ser Thr His Trp Gly Ala Asp Leu Ala Val Thr Pro Tyr Asp Tyr
1345                    1350                    1355                    1360

Gly Ala Lys Ile Ile Leu Ser Ser Ala Tyr His Gly Glu Met Pro Pro
                1365                    1370                    1375

Gly Tyr Lys Ile Leu Ala Cys Ala Glu Phe Ser Leu Asp Asp Pro Val
                1380                    1385                    1390

Lys Tyr Lys His Thr Trp Gly Phe Glu Ser Asp Thr Ala Tyr Leu Tyr
        1395                    1400                    1405

Glu Phe Thr Gly Asn Gly Glu Asp Trp Glu Asp Tyr Asn Asp Ala Phe
    1410                    1415                    1420

Arg Ala Arg Gln Glu Gly Lys Ile Tyr Lys Ala Thr Ala Thr Ser Leu
1425                    1430                    1435                    1440

Lys Phe Tyr Phe Pro Pro Gly Pro Val Ile Glu Pro Thr Leu Gly Leu
                1445                    1450                    1455

Asn


<210> 3
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<213> Porcine reproductive and respiratory syndrome virus

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Tyr Phe Trp Pro Phe Cys Leu Ala Ser Pro Ser Pro Val Gly Trp Trp
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Ser Phe Ala Ser Asp Trp Phe Ala Pro Arg Tyr Ser Val Arg Ala Leu
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Pro Phe Thr Leu Ser Asn Tyr Arg Arg Ser Tyr Glu Ala Phe Leu Ser
65              70                  75                      80

Gln Cys Gln Val Asp Ile Pro Thr Trp Gly Thr Lys His Pro Leu Gly
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Met Leu Trp His His Lys Val Ser Thr Leu Ile Asp Glu Met Val Ser
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Arg Arg Met Tyr Arg Ile Met Glu Lys Ala Gly Gln Ala Ala Trp Lys
        115             120                 125

Gln Val Val Ser Glu Ala Thr Leu Ser Arg Ile Ser Ser Leu Asp Val
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Val Ala His Phe Gln His Leu Ala Ala Ile Glu Ala Glu Thr Cys Lys
145             150             155                 160

Tyr Leu Ala Ser Arg Leu Pro Met Leu His Asn Leu Arg Met Thr Gly
            165             170                 175

Ser Asn Val Thr Ile Val Tyr Asn Ser Thr Leu Asn Gln Val Phe Ala
            180             185                 190

Ile Phe Pro Thr Pro Gly Ser Arg Pro Lys Leu His Asp Phe Gln Gln
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Trp Leu Ile Ala Val His Ser Ser Ile Phe Ser Ser Val Ala Ala Ser
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Cys Thr Leu Phe Val Val Leu Trp Leu Arg Val Pro Ile Leu Arg Thr
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<213> Porcine reproductive and respiratory syndrome virus

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<213> Porcine reproductive and respiratory syndrome virus

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<213> Porcine reproductive and respiratory syndrome virus

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